

CLAIMS

1. A positive-type photosensitive polyimide composition comprising a solvent-soluble polyimide which shows positive-type photosensitivity in the presence of a photoacid generator, which is obtained by polycondensation of at least one aliphatic tetracarboxylic dianhydride and/or alicyclic tetracarboxylic dianhydride and at least one aliphatic diamine and/or alicyclic diamine and/or diaminosiloxane; and said photoacid generator.

2. The polyimide composition according to claim 1, wherein the moiety in said aliphatic diamine and/or alicyclic diamine and/or diaminosiloxane, which moiety constitutes the main chain of said polyimide, consists essentially of C₁-C₁₅ saturated aliphatic structure and/or C₃-C₁₅ saturated alicyclic structure.

3. The composition according to claim 2, wherein said tetracarboxylic dianhydride is a saturated alicyclic tetracarboxylic dianhydride and/or bicyclo(2,2,2)-oct-7-ene-2,3,5,6-tetracarboxylic dianhydride and/or 5-(2,5-dioxo-tetrafuranyl)-3-methyl-4-cyclohexene-1,2-dicarboxylic anhydride.

4. The composition according to claim 3, wherein said saturated alicyclic tetracarboxylic dianhydride comprises a cyclopentanetetracarboxylic dianhydride, and/or cyclohexanetetracarboxylic dianhydride and/or cyclobutanetetracarboxylic dianhydride.

5. The composition according to claim 1, which is a polyimide copolymer comprising two or more diamines selected from the group consisting of 1,3-bis(3-aminomethyl)cyclohexane, 4,4'-diamino-dicyclohexyl-methane, bis(2-aminoethoxy)ethane, N,N-bis(3-aminopropyl)methylamine, ethylenediamine, 2,2'-diaminodiethyldisulfide, 1,4-bis(3-aminopropyl)piperazine, 3,4-bis(3-aminopropyl)2,4,8,10-tetraoxa[5,5]undecane, diaminosiloxane, trans-1,4-diaminocyclohexane, 1,3-diamino-2-hydroxypropane, and 3(4),8(9)-bis(aminoethyl)tricyclo{5,2,1,0}decane.

6. The composition according to claim 5, wherein said diamine has disulfide structure and/or diaminosiloxane in the moiety constituting the main chain.

7. The composition according to any one of claims 1-6, wherein said polyimide is a polyimide block copolymer obtained by polycondensing said tetracarboxylic dianhydride and said diamine in a solution in the presence of an acid catalyst.

8. The composition according to claim 7, wherein said acid catalyst is a composite catalyst consisting essentially of valerolactone and pyridine or methylmorpholine, and said polyimide block copolymer is one obtained by first polycondensing said tetracarboxylic dianhydride and said diamine in a solution, and then another tetracarboxylic dianhydride and/or diamine is(are) added for polycondensation to attain a final molar ratio of the tetracarboxylic dianhydride(s) to the diamine(s) in said block copolymer of 1:(0.95-1.05).

9. The composition according to any one of claims 1-8, wherein said polyimide has an average molecular weight in terms of polystyrene of 5000 to 100,000.

10. The composition according to any one of claims 1-9, wherein said polyimide does not substantially comprise conjugated double bond and aromatic structure.

11. A method for forming polyimide pattern comprising irradiating said polyimide recited in any one of claims 1 to 10 with a light in the presence of a photoacid generator, which polyimide is in the form of a thin film coating a substrate; and removing the irradiated regions with an alkaline developing solution.

12. The method according to claim 11, wherein a far-ultraviolet ray with a wavelength of not more than 365 nm is employed as said light.

13. The method according to claim 12, wherein a light beam with a wavelength of not more than 250 nm is employed as said light.

14. A method for forming a pattern of positive-type photosensitive polyimide comprising the steps of forming a photosensitive layer consisting essentially of said polyimide composition according to any one of claims 1 to 10 on a substrate;

selectively irradiating said photosensitive layer with a light beam having a wavelength of not more than 365 nm; heat-treating said photosensitive layer; and developing said photosensitive layer after said heat-treatment to selectively remove prescribed regions in said photosensitive layer.

15. Use of said polyimide recited in any one of claims 1 to 10 as a material for positive-type photolithography.

16. A method for forming negative-type pattern of polyimide comprising coating a substrate with the polyimide recited in any one of claims 1 to 10; selectively irradiating the polyimide with an actinic ray, the irradiated regions constituting a desired pattern; and developing the irradiated polyimide with an alkaline solution to dissolve the non-irradiated regions.

17. The method according to claim 16, wherein said actinic ray is electron beam.

18. Use of the polyimide recited in any one of claims 1 to 10 as a material for negative-type photolithography.